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PEC-SE-97-0005

May 15, 1997

Mr. David Will  
Mason & Hanger Corporation

UNIQUE DOCUMENT # SAC200124350000

Dear Mr. Will

Subject: Hazard Assessment for project 12-066 storage facility (u)

Attached is the draft Hazard Assessment Document (HAD) for the 12-066 storage facility project. The HAD provides the facility hazard categories and performance categories in accordance with DOE STD-1027-92 and DOE STD 1021-93 respectively. The facility was evaluated as two segments. The first segment is the storage area and the interlock. The second area is the unloading dock and the control room. The analysis was based on the identified inventory with no credit taken for engineered or administrative controls. The only reduction in release that was credited in the analysis was that the inventory is a solid form. The first segment has a facility hazard category of 2 and a performance category of 3. The second segment has a facility hazard category of 2 and a performance category of either 2 or 3 depending on the inventory assumed to be staged on the loading dock.

During the hazard analysis processes, currently being performed, the release scenarios will be identified along with their associated frequencies and consequences. Based on the results of the analysis, required controls, engineered and administrative, will be identified to prevent or mitigate the consequences of those events that are unacceptable. It is the classification process that will take credit for the controls such as the storage containers, building structure, control of combustibles, etc.

Please review the attached draft HAD and provide written comments to me. After all comments are received and resolved, we will issue the document as revision 0.

Sincerely,

*Larry Eppler*  
Larry Eppler

cc: P. Stewart

1. REVIEWED BY:	2/15/98
2. AUTHORITY (CIRCLE NUMBER(S))	
3. CLASSIFICATION CHANGED TO:	
4. COORDINATE WITH:	
5. CLASSIFICATION CANCELLED	
6. CLASSIFIED INFO BRACKETED	
7. OTHER (SPECIFY):	

WASH ATTACHMENTS/MH/CI

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Key Words:

Pits  
Plutonium  
Storage

**Hazards Assessment Document**  
**SURPLUS PIT STORAGE FACILITY**  
**UPGRADE**

**S. M. Patel**  
**Author & Task Leader**  
**May 1997**

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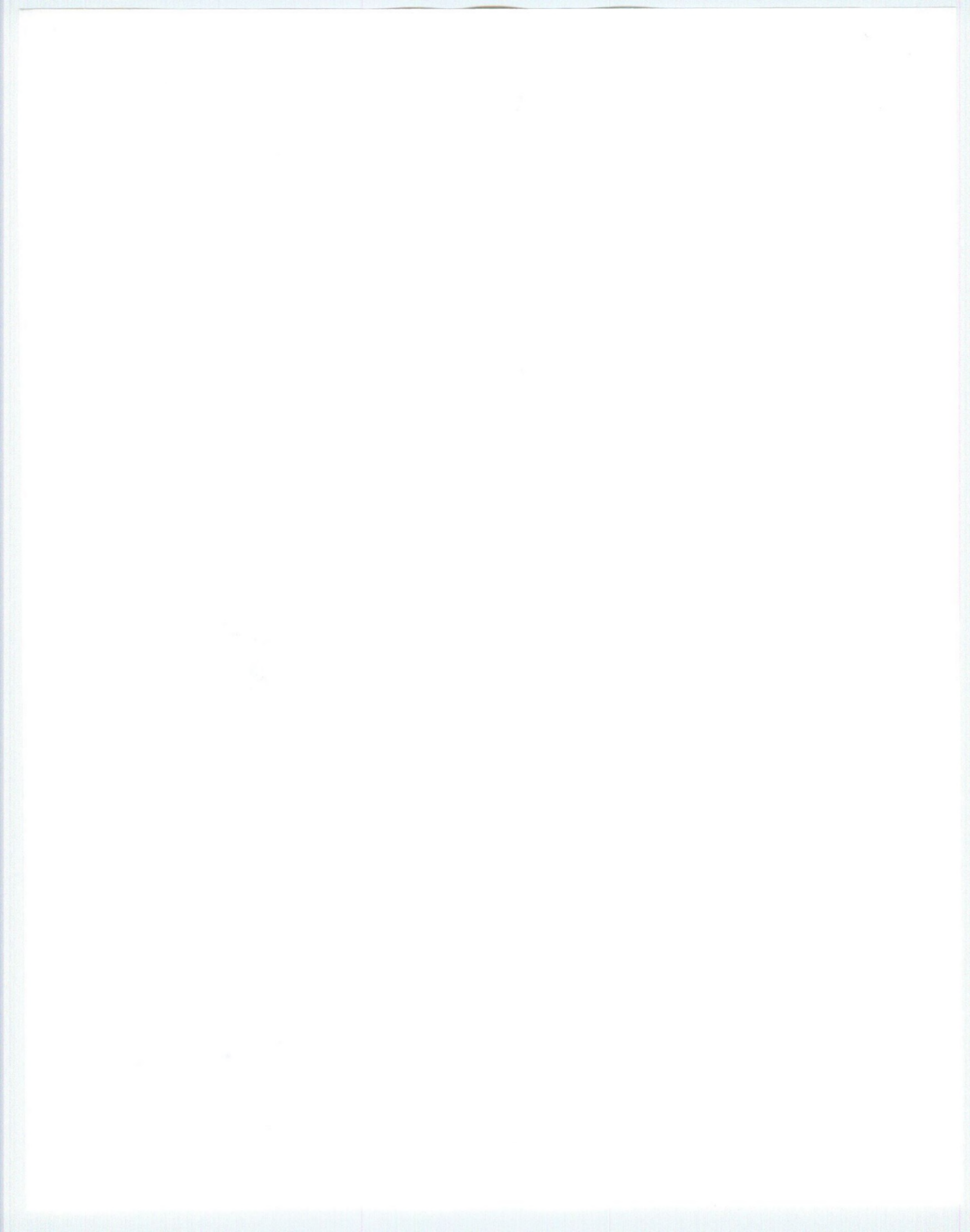
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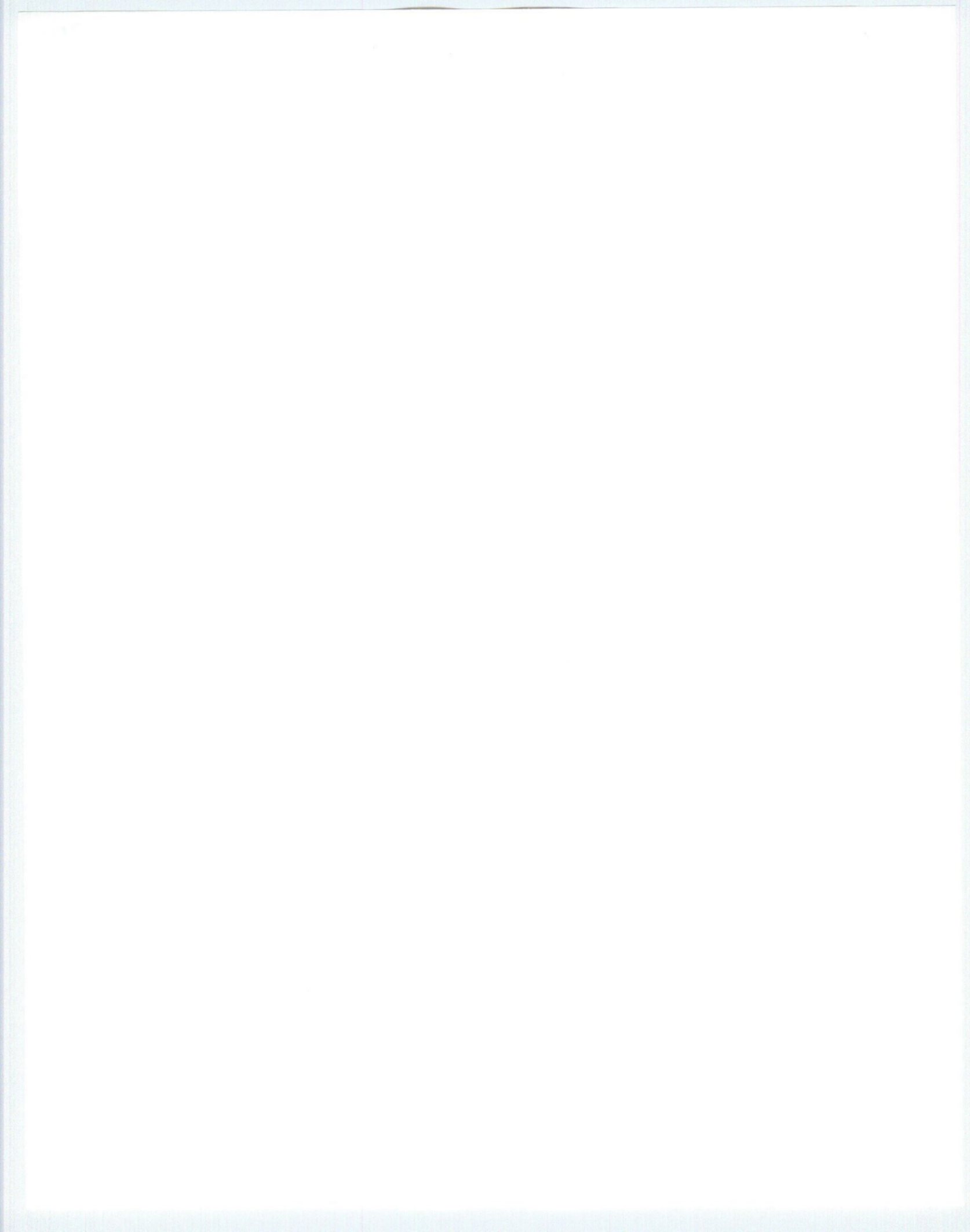
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Surplus Pit Storage Facility Hazards Assessment Document

S-HAD-G-00005, Rev. A

REVISION HISTORY

<u>Revision</u>	<u>Affected Pages</u>	<u>Description of Revision</u>
A	All	Original Issue for Pantex Review

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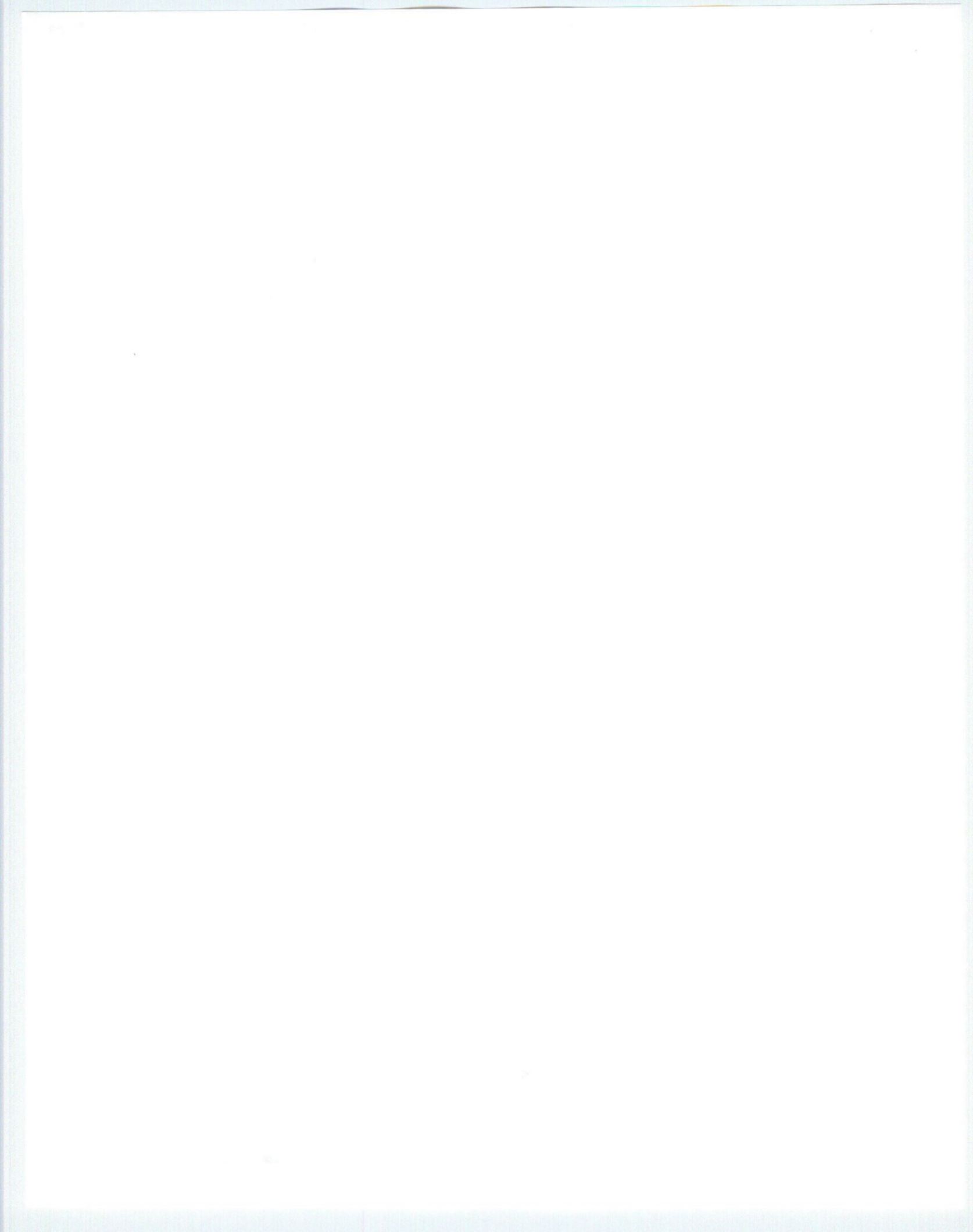
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ACRONYMS AND ABBREVIATIONS

AGV	Automated Guided Vehicle
ANS	American Nuclear Society
ANSI	American National Standards Institute
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
DOE	Department of Energy
EDE	Effective Dose Equivalent
g	gram or grams
HAD	Hazards Assessment Document
HC	Hazard Category
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilation, and Air Conditioning
kg	kilograms
PC	Performance Category
MAA	Material Access Area
PSO	Program Secretarial Officer
SRF	Source Reduction Factor
SSC	Structure, System, and Component
WSRC	Westinghouse Savannah River Company

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## 1.0 SUMMARY

This Hazards Assessment Document (HAD) provides an analysis of the Surplus Pit Storage Facility in accordance with Department of Energy (DOE) Order 5480.23, DOE-STD-1027-92, and DOE-EM-STD-5502-94, and provides hazard categorization based on the radiological hazards associated with the facilities (Ref. 1, 2, 3). In addition, this HAD provides preliminary Performance Categories (PCs) of these facilities based on the evaluation of the guidelines provided in DOE-STD-1021-93 (Ref. 4), Task Plan for the Surplus Pit Storage Facility (Ref. 5) and Pantex Specific Application Guide (Ref. 12) for DOE-STD-3009-94. The PCs are used to establish the structural design requirements for resistance to natural phenomena events as per DOE-STD-1020-94 (Ref. 6). This document does not cover the evaluation of chemicals on the ramp and the loading dock.

The dose consequences evaluated in this analysis were calculated using conservative methods without consideration for mitigation systems or administrative controls. The focus in this document is on the impact of a maximum energy or material source term release without credit for controls or regard for event frequency. The numerical results of this HAD will differ from results obtained when consideration is given to mitigation systems and administrative controls.

## 2.0 FACILITY DESCRIPTION AND SEGMENTATION

The Surplus Pit Storage Facility consists of Building 12-066, Control Room, ramp and loading dock. These facilities are located in the south end of the Material Access Area (MAA) of Zone 12 within the Protected Area of the Pantex Plant and will be upgraded to provide a cost-effective, safe, secure, and environmentally responsible storage facility for surplus pits in DOE's possession.

Building 12-066 is currently a weapons parts warehouse and is to be the vault storage and loading area for the Automated Guided Vehicle (AGV), which transports, places in storage and surveys the stored Stage-Right pits.

A portion of Building 12-082 (about 500 square feet.) is to be the location for the AGV Control Room. The Control Room will keep the location and status of all the pits stored in Building 12-066.

The loading dock was constructed in 1980 and is the proposed location for the charging station for the AGV and shielded forklift.

In determining the classification of DOE facilities, segmentation is used to avoid placing excessive requirements on simple co-located operations. The concept of independent facility segments is applied where facility features would preclude bringing material together or causing harmful interaction from a common severe phenomenon. DOE-STD-1027-92 (Ref. 2) states: "It is not desirable to estimate the potential consequences from an inventory of hazardous materials when facility features would preclude bringing this material together." Therefore, the standard permits the concept of facility segmentation provided the hazardous material in one segment could not interact with hazardous materials in other segments. For example, independence of Heating, Ventilation, and Air Conditioning (HVAC) and piping must exist in order to demonstrate independence for facility segmentation purposes.<sup>67</sup>





The Surplus Pit Storage Facility can be considered to be consisting of two segments:

Segment 1: Building 12-066 along with the interlock at the south-east corner of Building 12-066  
Segment 2: Control Room, loading dock and the ramp

The doors of Building 12-066 leading to the ramp and to Building 12-082 will be permanently locked and will be adequate so that Building 12-066 can work as an independent segment as required by DOE-STD-1027-92 (Ref. 2). The HVAC System in Building 12-066 will provide the proper environment for the health, safety, and comfort of personnel and for inventory and equipment protection. The HVAC system and process piping systems in Building 12-066 will not be shared by the other segment.

Figure 1 shows the layout of the Zone 12 Nuclear Facilities at Pantex Plant. Figure 2 shows the layout of the Surplus Pit Storage Facility.

### 3.0 FACILITY TYPE

A Nonreactor Nuclear Facility is defined in DOE Order 5480.23, Section 5.k, as a facility conducting "...those activities or operations that involve radioactive and/or fissionable materials in such form and quantity that a nuclear hazard potentially exists to the employees or the general public (Ref. 1). Included are activities or operations that:

1. Produce, process, or store radioactive liquid or solid waste, fissionable materials, or tritium;
2. Conduct separations operations;
3. Conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations;
4. Conduct fuel enrichment operations; or
5. Perform environmental remediation or waste management activities involving radioactive materials.

Incidental use and generating of radioactive materials in a facility operation (e.g., check and calibration sources, use of radioactive sources in research and experimental and analytical laboratory activities, electron microscopes, and x-ray machines) would not ordinarily require the facility to be included in this definition."

The Surplus Pit Storage Facility will handle and store weapons grade plutonium in the form of pits. It will contain radioactive sources in such quantity that a nuclear hazard potentially exists, and therefore it is classified as a Nonreactor Nuclear Facility.

### 4.0 HAZARDS ASSESSMENT METHODOLOGY

#### 4.1 HAZARD CATEGORY DETERMINATION

In DOE Order 5480.23, three hazard categories are defined (Ref. 1). A facility is classified as Hazard Category 1 if the hazards analysis shows the potential for significant offsite





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consequences, Hazard Category 2 if the hazards analysis shows the potential for significant onsite consequences, and Hazard Category 3 if the hazards analysis shows the potential for significant localized consequences only. The criteria for determining the radiological hazard category are provided in DOE-STD-1027-92 (Ref. 2).

The analysis to determine the hazard category is performed without credit taken for mitigating features or administrative controls. Examples of mitigating features and administrative controls are those specific facility features (not including site location), such as building containment, stacks, equipment, systems, actions, or operating conditions, that are established to control risk. This approach allows credit to be taken for the existing location and the physics of a material release and dispersion, but not for containment, confinement, shielding, protection systems, administrative controls, or human activities.

The radiological evaluation is accomplished by comparing the inventory of each radionuclide to the threshold quantities provided in Table A.1 of DOE-STD-1027-92 (Ref. 2). The criteria for determining the hazard category based on the radiological evaluations are as follows:

- Hazard Category 1
  - The facility has the potential for significant offsite consequences based on total curie content, potential material forms, and maximum energy source available for dispersion of the radioactive material. Only Category A Reactors or facilities designated by the Program Secretarial Officer (PSO) are designated as Hazard Category 1 in accordance with the directions of DOE-STD-1027-92.
- Hazard Category 2
  - The quantity of any radionuclide exceeds the Hazard Category 2 threshold quantity provided in Table A.1 of DOE-STD-1027-92. This quantity is based on 1 rem at 100 meters as determined in 10 CFR 30 and as modified by DOE (Ref. 7).
  - The minimum critical mass limit for any fissile material, as specified in ANSI/ANS-8.1 and ANSI/ANS-8.15, is exceeded (Ref. 8, 9).
  - Where there are combinations of radioactive materials, the sum of the ratios of the quantity of each radionuclide to the Hazard Category 2 threshold quantities exceeds one.
- Hazard Category 3
  - The quantity of any radionuclide exceeds the Hazard Category 3 threshold quantity provided in Table A.1 of DOE-STD-1027-92. This quantity is based on 10 rem at 30 meters based on a 24-hour exposure.
  - Where there are combinations of radioactive materials, the sum of the ratios of the quantity of each radionuclide to the Hazard Category 3 threshold quantities exceeds one.

**4.2 PERFORMANCE CATEGORY DETERMINATION**

DOE-STD-1021-93 provides guidelines to assign PCs to the Structures, Systems and Components (SSCs) based on the system safety classification and hazard categorization/classification data (Ref. 4).





A PC higher than the preliminary PC recommended by this document may be assigned to a facility structure on the basis of interaction effects with other facilities and cost or mission considerations.

5.0 HAZARDOUS MATERIAL INVENTORY

5.1 RADIOLOGICAL INVENTORY

5.1.1 SEGMENT 1, BUILDING 12-066

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5.1.2 SEGMENT 2, CONTROL ROOM, LOADING DOCK AND RAMP

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5.2 CHEMICAL INVENTORY

5.2.1 SEGMENT 1, BUILDING 12-066

No chemicals have been identified for use in this facility. (Ref. 10).

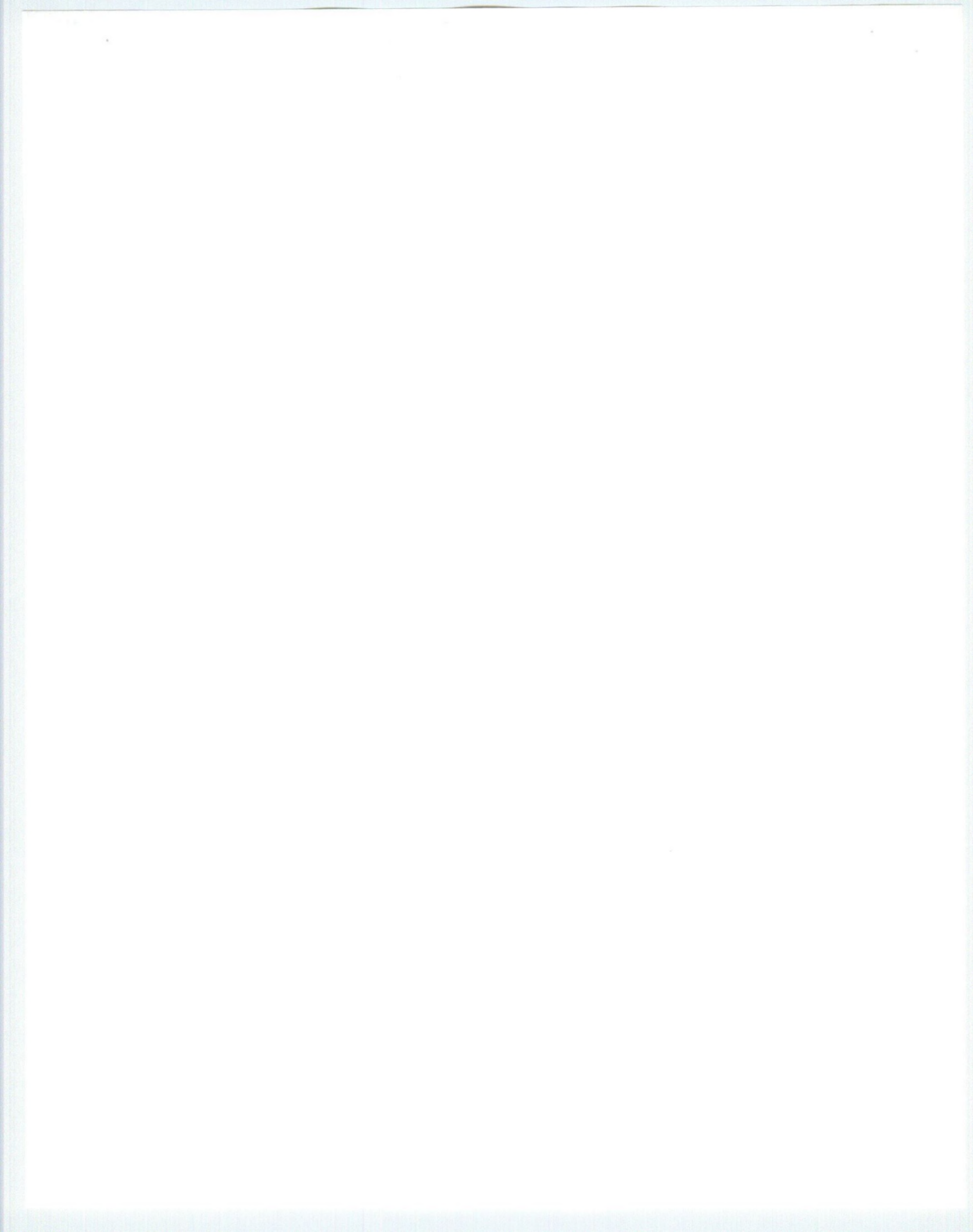
5.2.2 SEGMENT 2, CONTROL ROOM, LOADING DOCK AND RAMP

No chemicals have been identified for use in the control room. (Ref. 10). Chemicals in shipping containers will be handled in the loading dock while in transit to other facilities. The chemicals stored on the ramp or on the loading dock are not evaluated in this document.

6.0 ASSUMPTIONS

The following general assumptions were made in the analysis:

- The radiological concentration calculations are based on the airborne concentration without any credit for engineered features or administrative controls to mitigate consequences.
- The calculations used the following parameters:





- The onsite receptor is assumed to be located at 100 meters downwind of the release. The resulting dose of interest is the 50 year Committed Effective Dose Equivalent (CEDE) reported at the 50th quantile dose level when calculated independent of sector.
- The offsite receptor is assumed to be located at the closest downwind site boundary from the release location which is taken to be 1.45 km. The resulting dose of interest is 50 years CEDE reported at the 95th quantile dose level when calculated independent of sector.
- All doses are calculated using site specific meteorological data from the calendar year 1996.
- Doses are calculated for a three minute ground-level release without dry deposition.
- Inventory of non-radioactive materials, such as beryllium, contained in the pits is not considered for hazard categorization because the radiological inventory will bound the hazard categorization of the facility.
- There will be a maximum of six pallets with six pits per pallet (36 pits) at a time on the loading dock.
- The two segments will have independent HVAC systems and process piping systems.
- The Control Room, which is physically part of Building 12-082, is considered a part of Segment 2.
- The distance to the site boundary from the Surplus Pit Storage facility is 1.45 km (0.9 mile).
- Plutonium in the pits is Pu-239. Americium-241 and isotopic distribution of plutonium are not considered.
- Analysis of Building 12-082, Building 12-079 and other facilities due to the presence of hazardous material inventory in Building 12-066 and on the loading dock/ramp is not included in the scope of this project.
- Emergency exits at the south end of Building 12-066 leading to the ramp and the door at the north-east corner of Building 12-066 leading to Building 12-082 will be permanently shut such that the hazardous material inventory of one segment does not affect or interact with the hazardous material inventory of the other segment.
- Chemicals which may be stored on the loading dock or on the ramp while in transit to other facilities are not analyzed.





7.0 HAZARDS ASSESSMENT

7.1 RADIOLOGICAL HAZARDS ANALYZED IN ACCORDANCE WITH  
DOE-STD-1027-92

7.1.1 SEGMENT 1, BUILDING 12-066

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7.1.2 SEGMENT 2, CONTROL ROOM, LOADING DOCK AND RAMP

There are no radiological inventories associated with the control room.

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7.2 NUCLEAR CRITICALITY HAZARDS ASSESSMENT

7.2.1 SEGMENT 1, BUILDING 12-066

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7.2.2 SEGMENT 2, CONTROL ROOM, LOADING DOCK AND RAMP

b(3)

The radiological analysis involved an evaluation of the maximum radionuclide inventory in the above segments. The radionuclide inventory was compared to the threshold quantity for Pu-239 as provided in Table A.1 of DOE-STD-1027-92 (Ref. 2). These comparisons demonstrate that the quantities of Pu-239 in Segments 1 and 2 exceed the associated Hazard Category 2 threshold quantities and the associated minimum critical mass limit specified in ANSI/ANS-8.1 (Ref. 8). Therefore, according to the Hazard Category 2 threshold quantity definition in DOE-STD-1027-92, these segments are classified as Hazard Category 2.

These results are summarized in Table 1.





### 7.3 ANALYSIS OF CHEMICAL HAZARDS

#### 7.3.1 SEGMENT 1, BUILDING 12-066

No chemicals have been identified for use in this facility (Ref. 10). Hence chemicals were not analyzed for this segment.

#### 7.3.2 SEGMENT 2, CONTROL ROOM, LOADING DOCK AND RAMP

No chemicals have been identified for use in the control room (Ref. 10).

Chemicals in approved shipping containers will be temporarily stored on the loading dock while they are in transit to the other facilities. These chemicals were not analyzed as part of this document.

### 7.4 RADIOLOGICAL HAZARDS ANALYZED TO DETERMINE PRELIMINARY PERFORMANCE CATEGORY

The airborne release fraction for Pu-239 is 0.001 (Ref. 2). The source term is then obtained by multiplying the inventory by the release fraction. The onsite and offsite doses are obtained by multiplying the source term (kg) by the Effective Dose Equivalent (EDE) (rem/kg) obtained from Reference 11. The source terms and the radiological doses received by the onsite individual at 100 meters and by the offsite individual (99.5% meteorology) are shown in Table 2.

#### 7.4.1 SEGMENT 1, BUILDING 12-066

~~\_\_\_\_\_~~ <sup>DOE (b)(3)</sup> The onsite dose at 100 meters exceeds the guideline limit of  $1.00E+02$  rem for a Safety Significant SSC (Ref. 5) and the offsite dose at 1.45 km exceeds the guideline limit of 25 rem (Ref. 12). This building can be assigned a preliminary Performance Category of PC-3 (Ref. 4).

#### 7.4.2 SEGMENT 2, CONTROL ROOM, LOADING DOCK AND RAMP

There are no hazardous material inventories associated with the control room.

~~\_\_\_\_\_~~ <sup>DOE (b)(3)</sup> The onsite dose at 100 meters exceeds the guideline limit of  $1.00E+02$  rem for a Safety Significant SSC (Ref. 5) and the offsite dose at 1.45 km exceeds the guideline limit of 25 rem (Ref. 12). Segment 2 can be assigned a preliminary Performance Category of PC-3 (Ref. 4).

Alternately, Segment 2 can be assigned a preliminary Performance Category of PC-2 if no more than 6 pits are handled at a time.

~~\_\_\_\_\_~~ <sup>DOE (b)(3)</sup> The onsite dose at 100 meters exceeds the guideline limit of  $1.00E+02$  rem for a Safety Significant SSC (Ref. 5) and the offsite dose at 1.45 km is less than the guideline limit of 25 rem (Ref. 12).





8.0 RESULTS AND CONCLUSIONS

The radiological analysis performed in accordance with DOE-STD-1027-92 and DOE-EM-STD-5502-94 assigns an overall hazard categorization of Hazard Category 2, Nonreactor Nuclear Facility to the Surplus Pit Storage Facility (Ref. 2, 3).

The hazard categories and the performance categories of the three segments can be summarized as follows:

Segment	Preliminary Hazard Category	Preliminary Performance Category
Segment 1, Building 12-066	HC-2	PC-3
Segment 2, Control Room, Loading Dock and Ramp	HC-2	PC-3 (6 pallets with 36 pits) PC-2 (1 pallet with 6 pits)

The numerical results of this HAD should not be used in any context other than the preliminary hazard classification of the project. Specifically, these results should not be confused with results where appropriate consideration has been given to all the mitigation systems and administrative controls. This Hazard categorization is not valid for an inventory greater than the limiting radiological and chemical inventories established in this document.





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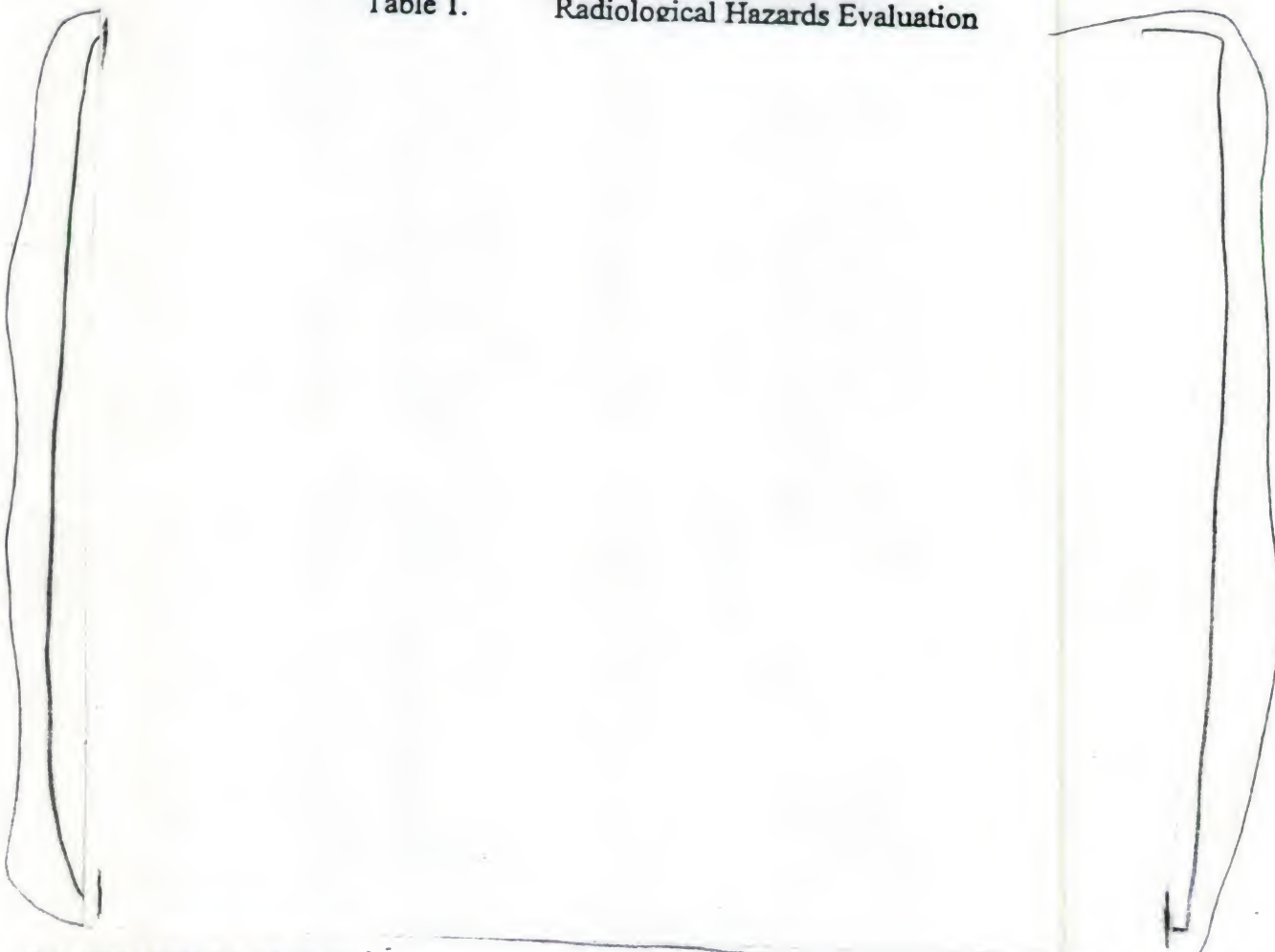




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10.0 TABLES

Table 1. Radiological Hazards Evaluation



<sup>a</sup> ANSI/ANS-8.1 (Ref. 8)

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Table 2

Dose Consequences for Preliminary Performance Categories

Note: The dose consequences evaluated in this analysis were calculated using conservative methods without consideration of mitigating SSCs or administrative controls and are only to be used for preliminary performance categorization. Therefore, these results should not be confused with results reported in other safety documentation where appropriate consideration is given to mitigating SSCs and administrative controls.

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11.0 FIGURES

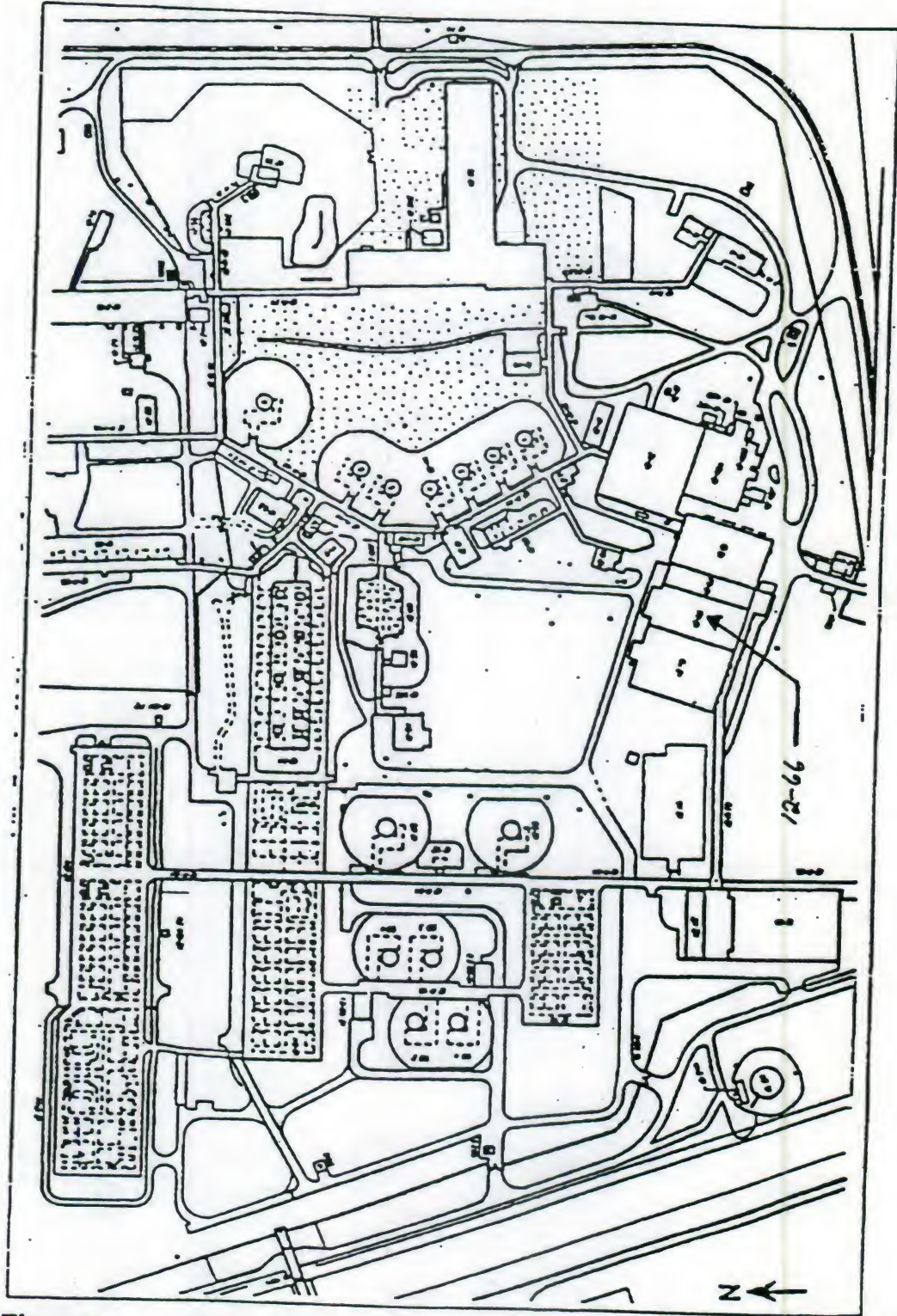


Figure 1 Layout of Zone 12 Nuclear Facilities at Pantex Plant







